APPENDIX D

SEQUENTIAL REMEDIATION PLAN

The algorithm used by Hall-Kimbrell is a modification of the Sawyer algorithm accepted by the United States Environmental Protection Agency. The modified Sawyer algorithm is highly regarded within the industry. Data acquired using the algorithm exhibit a high degree of validity and are an accurate representation of the material.

The algorithm consists of six additive and two multiplicative variables. The additive variables are material condition, water damage, exposed surface area, accessibility, activity and movement, and air plenum. All these variables are qualitative in nature. The multiplicative variables are friability and asbestos content. Asbestos content is the only quantitative variable. The algorithm is weighted with respect to friability and asbestos content since these variables will have the greatest affect on the exposure potential.

Due to the range used for each variable, the resultant value of the algorithm is 1 to 162. This number is referred to as the exposure potential. The field of exposure potential numbers is divided into four priority levels. A table listing the exposure potential range with the associated priority level follows.

Exposure Potential	Assigned Priority Level
60 - 162	Priority Level I
40 - 59	Priority Level II
20 - 39	Priority Level III
01 - 19	Priority Level IV

Little difference exists between the high and the low exposure numbers for consecutive priority levels. In other words, a Priority Level II value of 59 is nearly identical to a Priority Level I value of 60. The multiplicative variables have the greatest affect in the determination of exposure potential and further explanation follows.

Friability is defined as the ease with which a material, when dry, can be crumbled or reduced to dust by hand pressure. The values range from 1 (hard to crumble) to 3 (easily crumbled) in whole number increments. A slight change in friability can result in a dramatic change in exposure potential and priority level.

Asbestos content is a composite percentage of all types of asbestos found in the sampled material that has been analyzed by Polarized Light Microscopy with Dispersion Staining. The multiplicative values based on asbestos content used in the algorithm are as follows:

Asbestos Content	Multiplicative Value
<1%	0
1 - 50%	2
>50%	3

A one percent change in asbestos content (i.e. 50% to 51%) may have a substantial effect on the exposure potential and the assigned priority level. With all other variables for a given material equal, this one percent change in asbestos content could elevate the area from a Priority Level III to a Priority Level I.

Due to the factors previously discussed, the numerical value for exposure potential cannot be used as an absolute ranking system, but should be used as a guideline. In devising a sequential abatement or remediation program, the following aspects should be incorporated. Both the exposure potential and the frequency of occupation should be considered. This will, for example, prevent a situation in which an infrequently accessed tunnel with an exposure potential of 90 is remediated prior to a continuously occupied production floor with an exposure potential of 60. Consideration should also be given to lower priority level materials found in proximity to Priority Level I areas. It is highly cost effective to remediate all asbestos-containing materials within a given containment area versus erecting individual containments as each priority level is remediated in turn.

Second and third floor materials were magnesia pipe insulation with associated mudded joint packing on high pressure steam and product lines in numerous locations on each floor. (Please refer to the spreadsheets for specific material quantities and locations, and area comments.) Wrapped cardboard/paper pipe insulation and associated mudded joint packing were observed on domestic water and high pressure steam lines. Tank insulation in the second floor kettle room whirlpool; and on the third floor, Part 21 convertor tank, adjunct cooker, mash tub, and caustic tank was also found asbestos-containing. Magnesia pipe insulation and associated mudded joint packing were observed on domestic water and high pressure steam lines on the fourth and fifth floors. All these materials were in good condition, with minor contact and water damage, and have been classified as Priority Levels III and IV. They should be repaired and monitored as part of an operations and maintenance program until they are removed.

Tank insulation on the second floor north and south brew kettles; mezzanine level whirlpool tanks; and the third floor top tank room, mash tub, adjunct cooker, convertor tank, and caustic tank was not sampled. The tanks are enclosed in a stainless steel jacket that restricts access. Sampling Release Forms for these areas are included in Appendix G.

Materials sampled but determined nonasbestos-containing by laboratory analysis were pipe covering and associated mudded joint packing on domestic water lines near the caustic tank in the first floor spent grain room; and wrapped cardboard/paper pipe insulation in the fourth floor grain hopper room.

Nonfriable materials were not sampled, but are listed in Appendix E. Nonfriable materials do not create an exposure hazard unless they are sawn, broken, ripped, pulverized, or otherwise altered. However, if renovation or demolition of the facility is planned, they should be sampled and analyzed for asbestos content.

CORPORATE OFFICE BUILDING

BUILDING: 24 H-K BUILDING: 024

This Corporate Office building is a two-story, 3,360 square foot, masonry and concrete structure with a partial basement. The facility was constructed in 1954 and houses sales, marketing, and plant management offices. It was constructed in 1954 and is heated with steam radiant and forced-air units.

Laboratory analysis of bulk samples confirmed the presence of asbestos in magnesia pipe covering and associated mudded joint packing on low pressure steam lines in the basement storage area. The pipe insulation and mudded joint packing were in good condition, with minor damage, and have been classified as Priority Level III. They should be monitored as part of an operations and maintenance program until they are removed.

Acoustical ceiling tiles on the first and second floors were sampled and were determined nonasbestos-containing by laboratory analysis.

FERMENTATION

BUILDING: 25 H-K BUILDING: 025

The Fermentation Building is a five-story, 39,857 square foot, cinder block and concrete facility that was constructed in 1958.

Laboratory analysis of bulk samples confirmed the presence of asbestos in debris, pipe insulation, mudded joint packing, and tank insulation. Magnesia pipe covering debris was found on the fourth floor above the ceiling in the janitor's closet. The debris has been classified as Priority Level I, is very friable, and should be removed.

Magnesia pipe insulation with associated mudded joint packing on high pressure steam lines and wrapped cardboard/paper pipe insulation with associated mudded joint packing on domestic water lines were observed in the tank room and various other areas in the basement, and above the ceiling in the restrooms on the first, second, and third floors. This material was also observed above the ceiling in the fourth floor janitor's closet. Other asbestos-containing materials included convertor tank insulation in the basement tank room; cork pipe covering on refrigeration supply and return lines in the basement; and wrapped cardboard/paper pipe insulation with associated mudded joint packing on domestic water lines in the second, third, and fourth floor stairwells. These materials were in good condition, with limited contact and water damage, and have been classified as Priority Levels III and IV. They should be repaired and monitored as part of an operations and maintenance program until they are removed.

Mudded joint packing associated with nonsuspect pipe covering on basement domestic water lines was sampled and determined nonasbestos-containing.

Nonfriable materials were not sampled, but are listed in Appendix E. Nonfriable materials do not create an exposure hazard unless they are sawn, broken, ripped, pulverized, or otherwise altered. However, if renovation or demolition of the facility is planned, they should be sampled and analyzed for asbestos content.

HOT WATER HOUSE

BUILDING: 27 H-K BUILDING: 027

The Hot Water House is a single-level, concrete and cinder block structure that is used to heat water for brewing. There is no HVAC system in this building.

Suspect materials sampled were magnesia pipe covering and the associated mudded joint packing, mudded joint packing on nonsuspect pipe insulation, and tank insulation. Pipe insulation and mudded joint packing on domestic water and high pressure steam lines near the large exchanger, in the southwest corner near the small exchanger, and above the pumps and condensate tank along the south wall were determined asbestos-containing. Also confirmed asbestos-containing was tank insulation near the center of the building above the pump. These materials were in fair to good condition, with minor contact and water damage, and have been classified as Priority Level IV. It is recommended any damaged areas be repaired and the materials included in an operations and maintenance program.

Materials sampled but determined nonasbestos-containing were mudded joint packing on nonsuspect pipe covering on domestic water lines in the northwest corner near the floor and tank insulation in the southwest corner of the building.

WAREHOUSE

BUILDING: 33 H-K BUILDING: 033

This is a single-level storage facility that was constructed in 1954 of steel and cinder blocks with concrete floors. The building is heated by a forced-air steam system using suspended heater units.

Suspect materials sampled were magnesia and wrapped cardboard pipe covering and associated mudded joint packing, and packing on nonsuspect pipe covering; tank insulation; debris; and acoustical ceiling tiles.

Tank insulation on the first floor in the southeast corner above the women's break room was determined asbestos-containing. All pipe covering and mudded joint packing in this warehouse were also confirmed asbestos-containing and have been classified as Priority Level III. (Please refer to the spreadsheets for specific material quantities and locations, and area comments.) These materials should be included in an operations and maintenance program.

Sections of asbestos-containing magnesia pipe lagging are located on the first floor above the women's break room. They have been assigned a Priority Level I classification and should be removed as soon as possible.

Acoustical ceiling tiles above the women's break rooms on the first and second floors were determined nonasbestos-containing. However, those on the first floor where the asbestos-containing magnesia pipe lagging was found should be HEPA vacuumed when the debris is removed to eliminate any contamination from the ceiling tiles.

Vinyl floor tiles were observed throughout the building, but were not sampled. The tiles are nonfriable and present little exposure hazard unless damaged or otherwise physically altered. They should be monitored as part of an operations and maintenance program and analyzed prior to any renovation or demolition of the facility.

BOTTLING HOUSE

BUILDING: 35 H-K BUILDING: 035

The Bottling House is a two-story concrete and steel structure with a mezzanine on the second floor and a partial basement. It was constructed in 1955 and is heated by a steam, forced-air system which distributes warm air through suspended heater units.

Laboratory analysis of bulk samples confirmed the presence of asbestos in debris, pipe insulation, mudded joint packing, tank insulation, and vibration joint cloth. The debris was observed in the southeast corner of the mezzanine level above the heater unit. It is very friable, has been classified as Priority Level I, and should be removed. Magnesia pipe insulation and mudded joint packing were observed on steam lines on the basement, first, second, and second floor mezzanine levels. Mudded joint packing used in conjunction with nonsuspect pipe insulation was found on domestic water and drain lines in the basement and on the first and second floors. Asbestos-containing vibration joint cloth was observed on the air handling unit in the first floor men's break room. All these materials were in good to fair condition, with minor contact and water damage, and have been classified as Priority Level III. They should repaired and monitored as part of an operations and maintenance program until they are removed.

Materials sampled and found nonasbestos-containing through laboratory analysis were debris in the south half of the building near the soap tank, acoustical ceiling tiles on the first and second floors, and drop ceiling tiles on the second floor.

Nonfriable materials were not sampled, but are listed in Appendix E. Nonfriable materials do not create an exposure hazard unless they are sawn, broken, ripped, pulverized, or otherwise altered. However, if renovation or demolition of the facility is planned, they should be sampled and analyzed for asbestos content.

WAREHOUSE

BUILDING: 36 H-K BUILDING: 036

This warehouse is a single-level concrete and cinder block building constructed in 1964. It is heated by a steam, forced-air system utilizing suspended unit heaters.

The only suspect material in the building was mudded joint packing on low pressure steam and drain lines. All samples of the packing were asbestos-containing, and it has been classified as Priority Level III. The packing was in good condition, with minor contact and water damage. The damaged areas should be repaired and the material included in an operations and maintenance program.

PARTS BUILDING

BUILDING: 37 H-K BUILDING: 037

The Parts Building is a two-story, cinder block and steel, storage facility built in 1949. The facility uses a steam, forced-air heating system with suspended unit heaters.

The only asbestos-containing material in the building was mudded joint packing on drain lines. The packing was in good condition, with minor contact and water damage, and has been classified as Priority Level III. The damaged areas should be repaired and the material included in an operations and maintenance program.

Acoustical ceiling tiles were sampled and were determined nonasbestos-containing by laboratory analysis.

Vinyl floor tiles were observed throughout the building, but were not sampled. The tiles are nonfriable and present little exposure hazard unless damaged or otherwise physically altered. They should be monitored as part of an operations and maintenance program and analyzed prior to any renovation or demolition of the facility.

BOTTLING HOUSE

BUILDING: 38 H-K BUILDING: 038

The Bottling House is a three-story, 41,990 square foot, concrete and steel structure with a full basement. The facility was constructed in 1968 and is used for bottling and packaging. A steam, forced-air system supplies suspended heater units.

Materials sampled and found asbestos-containing through laboratory analysis include pipe insulation and mudded joint packing. Asbestos-containing magnesia pipe insulation with associated mudded joint packing were observed on high pressure steam lines on the first floor and on low pressure steam lines on the third floor. Mudded joint packing was observed on low pressure steam and domestic water lines on the second floor. The mudded joint packing on the low pressure steam lines on the east side of the second floor pasteurizer were confirmed asbestos-containing. These materials were in good condition and have been classified as Priority Level III. They should be repaired and monitored as part of an operations and maintenance program until they are removed.

Pipe insulation on low pressure steam lines on the second floor, and stored ceiling panels on the third floor were sampled and determined nonasbestos-containing.

Nonfriable materials were not sampled, but are listed in Appendix E. Nonfriable materials do not create an exposure hazard unless they are sawn, broken, ripped, pulverized, or otherwise altered. However, if renovation or demolition of the facility is planned, they should be sampled and analyzed for asbestos content.

WAREHOUSE

BUILDING: 40 H-K BUILDING: 040

This warehouse is a one-story facility containing beer pasteurizing equipment. It was constructed in 1979 of corrugated steel, and is heated by a steam, forced-air system.

Pipe insulation and associated mudded joint packing were sampled and were determined nonasbestos-containing by laboratory analysis.

MAINTENANCE SHOP

BUILDING: 41 H-K BUILDING: 041

The Maintenance Shop is a two-story, wood and brick structure. It is used for storage and beer sales, and is heated by a combination of radiant and forced-air steam systems, which deliver warm air through radiators and suspended heaters.

Acoustical ceiling tiles were the only suspect materials in this building. Laboratory analysis of the tiles determined them nonasbestos-containing.

Vinyl floor tiles were observed throughout the building, but were not sampled. The tiles are nonfriable and present little exposure hazard unless damaged or otherwise physically altered. They should be monitored as part of an operations and maintenance program and analyzed prior to any renovation or demolition of the facility.

P.O.S.

BUILDING: 42 H-K BUILDING: 042

Building 42 is a two-story, concrete and brick facility constructed in 1949. It is used as office space for the advertising department. Heat from the forced-air natural gas system is delivered throughout the building by duct work above the ceiling.

Trowelled acoustical ceiling plaster on the first floor and on the second floor in the southwest room and the ends of the east room was sampled and confirmed asbestos-containing. The material was in good to fair condition and has been classified as Priority Level II. Any damage should be repaired and the material should then be included in an operations and maintenance program.

The trowelled acoustical ceiling plaster on the second floor in the central area and in the center of the east room was determined nonasbestos-containing through laboratory analysis.

Vinyl floor tiles were observed throughout the building, but were not sampled. The tiles are nonfriable and present little exposure hazard unless damaged or otherwise physically altered. They should be monitored as part of an operations and maintenance program and analyzed prior to any renovation or demolition of the facility.

WAREHOUSE

BUILDING: 43 H-K BUILDING: 043

This warehouse is a single-level, concrete and steel building constructed in 1983. Suspended units supply the steam, forced-air heat.

Drop-in ceiling panels on the mezzanine were the only suspect materials found in this building. Laboratory analysis of bulk sampled collected determined the tiles nonasbestos-containing.

Vinyl floor tiles were observed throughout the warehouse, but were not sampled. The tiles are nonfriable and present little exposure hazard unless damaged or otherwise physically altered. They should be monitored as part of an operations and maintenance program and analyzed prior to any renovation or demolition of the facility.

BRIDGE

BUILDING: 45 H-K BUILDING: 045

The elevated walkway is a one-story, steel connector bridge. There is no heating system for the bridge.

Pipe insulation and mudded joint packing on high and low pressure steam lines were confirmed asbestos-containing and have been classified as Priority Level III. The materials were in good condition, with minor contact and water damage, and should be included in an operations and maintenance program. Pipe covering on the product line was analyzed and determined nonasbestos-containing.

NO SUSPECT MATERIALS

No friable, nonfriable, or cementitious suspect materials were observed in the following building:

Building Number	Building Name
19/20	Grain Handling
39	Syrup House
44	Kegging Complex
46	Fuel Oil Pit

NO FRIABLE MATERIALS

No friable suspect materials were observed in the following building:

Building Number	Building Name
47	South Guard House

VI. SYNOPSIS OF ANTICIPATED ABATEMENT COST

The spreadsheets included in this report contain a breakdown of the budgetary cost estimates for each material, a total for each area, a subtotal for each building, and finally, a grand total for removal of all asbestos-containing materials and replacement with nonasbestos-containing materials of equivalent or better quality.

The estimated abatement cost is budgetary in nature, since there are many variables which will affect the final construction estimate. Once it has been decided which materials to address, either totally or in a phased fashion, a final estimated construction cost may be determined based on variables such as time frame for construction, type of replacement material chosen, occupancy during abatement, and size of project chosen. All budgetary estimates are based on removal and replacement with nonasbestos-containing materials. This option has been chosen because it usually represents the maximum expenditure, in the short run, that the owner would be making, as opposed to other temporary forms of abatement such as encapsulation or enclosure. Encapsulation is a temporary measure which will seal and, therefore, retard fiber release for only a limited period of time. However, the materials remain in the building and must be monitored periodically as part of an operations and maintenance program. If, however, the study identifies selected areas which we would recommend be encapsulated, enclosed, rewrapped, or otherwise temporarily enclosed, these are so noted in the specific comments and recommendations. There are no standard cost-estimating guidelines that can be used in this report to establish those estimates, since there are numerous variables that affect the final cost.

When attempting to provide a synopsis of the various options available in making an abatement decision, only general options or alternatives can be addressed. There are many combinations of areas and materials which may be addressed in any one abatement project. Historically, most building owners have chosen one of two types of projects:

1. Removal of All Asbestos-Containing Materials and Replacement with Nonasbestos-Containing Materials: This option is the most costly in the short run and may be the most difficult to pursue, considering the possible magnitude of the project, the associated funds which must be appropriated, and the difficulty of moving building occupants to allow for abatement of all materials in one project. However, this option will eliminate the asbestos exposure potential and any problems associated with the presence of asbestos-containing materials.

2. A Phased Abatement Program by Priority: In most cases, the most prudent decision is to remove the asbestos-containing materials on a phased basis, beginning with all of the Priority Level I materials or a combination of the Priority Level I and Priority Level II materials. This option allows the client to expend the first funds on those areas which present the most severe exposure potential. Exposure to any asbestos-containing material which remains is controlled under an operations and maintenance program until those materials can be removed. In many cases, building owners will actually gear a phased abatement program to the priority level, so that Priority Level I materials are slated for removal the first year, Priority Level II materials will be addressed in the second year or second phase, Priority Level III materials in the third year or third phase, and so on.

For budgeting purposes, we have included two cost estimates: one for removal of asbestos-containing materials in *all* priority levels and replacement with nonasbestos-containing materials, and one cost estimate for removal/replacement of *only* Priority Level I materials.

Professional Fees and Other Expenses

In general building construction, the architect's estimate is used as a base figure, with contingency fees added to determine a total project cost figure. Contingency fees include unexpected bid fluctuations, last minute owner-requested change orders, and other changes that may not be anticipated. An asbestos project is no different; therefore, a 5 to 15 percent contingency should be added depending on the size of the project.

Professional fees must also be considered in the total project scope, since almost all abatement projects today must be designed and managed by a professional engineering or consulting firm specializing in this unique area. The fees for designing the project; developing the plans and specifications; conducting all the necessary prebid and preconstruction conferences; and providing contract administration, supervision and final clearance of the project are usually based either on a percent of the total construction cost (with the percentage dropping as the total cost of construction increases) or on a lump sum or "not to exceed" basis. The professional fees for managing and designing the project and ensuring it is being carried out under stringent, safe conditions could range from 5 to 8 percent for projects over one-quarter of a million dollars in construction estimate, to as high as 10 to 12 percent for much smaller projects. The fees are always exclusive of reimbursable expenses and travel-related costs.

On-site air monitoring and construction supervision is absolutely vital during an asbestos abatement project. Unlike the general construction project in which the architect or engineer checks on the job from time to time, the unregulated nature of the abatement industry requires constant vigilance to ensure that the contractor is complying with all aspects of the specifications, that the procedures are followed to the letter, and that sophisticated monitoring of not only the air inside the work area but also the air outside the work area and inside the building is carried out to be sure that asbestos fiber levels do not exceed safe levels. In addition, the air monitoring records provide the owner with solid information as to the ongoing safety of the project and can be used in a public relations program, since tenants or other building occupants are concerned about the "healthfulness" of their spaces during and after an asbestos abatement project.

The fees for an on-site air monitoring crew and an on-site laboratory for rapid analysis of these critical barrier and final clearance samples are either charged on a per shift basis or as a percent of the total construction cost, depending on the size of the project. They are usually separate from the architectural/engineering fees but may in some instances be combined into one contract with the architectural/engineering portion of the project. Regardless of the abatement alternative chosen, the cost for air monitoring, including construction supervision and management, will be approximately two (2) percentage points higher than the architectural/engineering fees. As a general rule of thumb, it can be estimated that the associated architectural/engineering fees, construction supervision, air monitoring fees, reimbursable expenses, will run approximately 15 to 17 percent of the construction cost for larger projects and could be as high as 20 to 25 percent of the construction cost for smaller projects.

In addition to professional fees during the actual project, there are other fees that may be associated with the asbestos abatement program. These include:

1. The cost of the asbestos assessment survey.
2. The cost to develop and maintain an operations and maintenance program to monitor asbestos-containing materials remaining in the building system.
3. The cost of relocation, in some instances, of employees and other building occupants during asbestos abatement.
4. Down time in productivity for personnel administering the asbestos abatement program.
5. Litigation assistance cost if a cost recovery lawsuit is planned to recover the cost of asbestos abatement from the manufacturers.
6. Other internal costs related to the program.

The following cost estimates give an example of the various expenses based on selected options. Although the first option, removal of all asbestos-containing materials in all Priority Levels and replacement with nonasbestos-containing materials, may not be chosen, a cost estimate is nevertheless supplied to illustrate the cost savings in such a project. The second option covers removal/replacement of only Priority Level I asbestos-containing materials.

COST ESTIMATE

ESTIMATE I: Removal of all asbestos-containing materials in Priority Levels I through IV and replacement with nonasbestos-containing materials.

Total Removal/Replacement	$1,159,594
10% Contingency	$115,959
Total Removal/Replacement with Contingency	$1,275,553

The above total cost with contingency is an estimate of the actual cost once the bids are opened or the project is negotiated with a contractor.

Architectural/Engineering fees for design management, development of specifications and plans, etc.	
Estimated at 6.6% of Total Construction Cost:	
6.6% X $1,275,553	$84,186
On-site air monitoring and construction supervision during abatement (based on $490.00 per 8-hour shift per technician)	
Estimated at 224 8-hour shifts:	
224 X $490	$109,760
Reimbursable out-of-pocket and travel-related expenses	
Estimated at 1.0% of Total Construction Cost:	
1.0% X $1,275,553	$12,756
Total Project Estimate Including Professional Fees and Contingency	$1,482,255